Volunteered Geographic Information constructions in a contested terrain: A case of OpenStreetMap in China

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Abstract:

The recent explosive growth of user-generated geographic information has drawn significant attention from GIS scholars and human geographers. Volunteered Geographic Information (VGI) here refers to a key component of such a phenomenon, comprising both a range of practices of geographic information production and dissemination by volunteers as well as new forms of geospatial data produced and curated through various interactive online platforms and mobile devices such as OpenStreetMap (OSM) and Google Maps. VGI constructions have raised questions on spatial knowledge, power, and context. Through a study that examines social constructions of OSM in China, this paper makes two contributions to the existing literature: providing a political economic account of VGI constructions in China and exploring legalities in VGI research. Informed by research in critical GIS, this paper traces political economic conditions in relation to OSM constructions and examines OSM contributors' experiences and how these experiences constitute OSM development and usage. Drawing upon law and society research, this paper investigates how OSM mappers encounter the state's regulatory scheme of online mapping. This legality perspective of spatial data production and usage is a topic rarely explored in VGI studies. With interview data and document analysis, this paper unravels processes of powerful state institutional arrangements to control and invest in VGI simultaneously, entrepreneurs' interest in developing location-based services using VGI data, and experiences from a tech-savvy group in exploring and making VGI. While individual experiences vary, they show efforts of questioning embedded power relations shaping spatial data production in these continuously evolving, contested technoscientific and social landscapes.

Keywords: Critical GIS, Volunteered Geographic Information (VGI), OpenStreetMap (OSM), Internet mapping industry, legality, China

1. Introduction

"[I]f capitalisms are always already multiple and mutable, then the challenge is less one of creating a grand unified theory of capitalism than one of contributing to a proliferation of thick, multiple, locally grounded analyses of technoscientific market regimes and practices." (Sunder Rajan 2006, p.31)

"Legal and political institutions lead, as much as they are led by, society's investments in science and technology." (Jasanoff 2004, p.16)

The emergence of Web 2.0 technologies and the increasing availability of high-resolution remotely sensed imagery and mobile devices equipped with GPS have given rise to an unprecedented number of individuals and groups generating and sharing maps and spatial data online. This phenomenon has been associated with terms such as neogeography (Turner 2006), volunteered geographic information (VGI) (Goodchild 2007), and geoweb (Scharl and Tochtermann 2007). This paper focuses on the term of VGI, referring to practices of producing and disseminating geographic information by volunteers as well as new forms of data produced in these processes, such as data produced through Google Maps, OpenStreetMap (OSM), and Wikimapia. This phenomenon, marked by user-generated geographic content, has sparked discussions on broader questions on spatial knowledge, power, and context.

Much of the scholarly work in Geography has been informed by critical GIS and cartography research, a body of work investigating how spatial data and knowledge are generated, represented and shared by various groups in different contexts (Schuurman 2000; Chrisman 2005; Sheppard 2005; Elwood et al. 2012). While the intertwining relations between society and geospatial technologies have been widely recognized and explored, political economic

accounts of VGI are still sparse (Thatcher et al. 2016). If we agree with Sunder Rajan's (2006) remark listed above regarding the importance of interrogating various forms of capitalisms in relation to technoscentific developments, it is vital to provide more locally grounded analyses of VGI from a political economy lens. Moreover, research on the legal perspective of VGI is lacking. As highlighted by a quotation from Jasanoff (2004) above that legalities are intertwined with society's investments in science and technology, it is important to conduct more research on the legal perspective of VGI, which, in turn, helps us better understand the political economy perspective as they are mutually constituted. I attempt to address these two issues using a case of OSM in China.

OSM, founded in 2004 by Steve Coast in the UK, is a prime example of VGI with millions of registered users worldwide. However, OSM is deemed illegal in China. Despite its legal status, OSM has drawn increasing attention from a variety of individuals and groups in China. This is amid the state's recently announced emphasis in developing geoinformation industry. Yet little do we know about how OSM mapping practices have taken place in China and what processes have facilitated or constrained these mappings. Also, what might be the implications and impacts of these OSM constructions? This paper attempts to address these questions through telling 'a map story', in line with Pickles's (2004) call for multiple map stories to stress a poststructuralist point about maps, arguing that maps are multivocal and our accounts of the spaces maps represent and construct must also be multivocal. Meanwhile, this paper is also informed by Kitchin and Dodge's (2007) framework that views maps as always in the making and as embodied practices.

Therefore, this paper has two broad aims. First, drawing upon critical GIS research, it seeks to provide a "thick, multiple, and locally grounded" (Sunder Rajan 2006, p.31) analysis of VGI constructions situated in a particular geographic context, documenting the vastly

growing interactions and engagement with online mapping as well as location-aware devices through the intersection of political economic processes and individual experiences. Existing studies tend to focus on one of the two abovementioned aspects. With this aim, this paper makes an empirical contribution to the VGI literature through an analysis situated in China. Second, it calls attention to legalities of VGI constructions that might take different forms at different times and in different places. A few studies have addressed a legal perspective in critical GIS and cartography research. Yet more studies on how people encounter legal institutions and instruments are needed. Informed by insights from law and society studies, this paper incorporates the aspect of legality into studying VGI constructions and usage, accounting for a 'contested terrain' (Vincent 1994) that is bound with resistance and negotiations addressing asymmetrical power relations. To that end, this study contributes theoretically to existing research on VGI.

In what follows, Section 2 provides a literature review for the paper, followed by Section 3 on methods used in this study. Section 4 charts major online mapping industry developments and policy discourses in China. It pays attention to how these developments might shape OSM and VGI constructions as well as to how Internet mapping and VGI might influence the ways the state sees its role in spatial data production and how private sector actors might seek to engage with VGI and navigate in a market that continues to evolve. Section 5 discusses OSM contributors' experiences, illustrating their main motivations and negotiations of spatial knowledge production through OSM and moments of encounter concerning issues of legality. This section details how OSM constructions manifest as a contested terrain, not only in terms of the struggles to represent certain spatial knowledge through collective and yet individualised mapping by non-experts, but also in terms of the nuanced resistance to dominant state discourses and control of mapmaking in China. Section 6 concludes the paper,

calling for more research on documenting dynamic VGI constructions and arguing that more attention to political economic processes and legalities of spatial knowledge production can provide a fuller picture of VGI constructions.

2. Deconstructing and employing VGI

2.1. VGI in political economy and VGI as emancipatory potential

A burgeoning body of work has investigated the emergence and proliferation of VGI and associated social and political implications in critical GIS research (e.g., Elwood et al. 2012; Leszczynski and Wilson 2013; Young and Gilmore 2014; Sieber et al. 2016). Two strands of work in this literature informs this paper. One strand concerns with situating the growth of VGI within broader technological transformations and socio-political and economic forces and studying the impacts and implications of VGI production and usage (e.g., Haklay et al. 2008; Elwood and Leszczynski 2011; Leszczynski 2012; Wilson 2012). I will focus on the political economy perspective from this strand of work below.

Leszczynski (2012) analyses how the geoweb has emerged from a neoliberal logic, characterized by the state rolling back from the cartographic project and the market rolling out, "subsuming the mapping enterprise to the imperatives of technoscientific capitalism" (p.72). Nonetheless, in practice, the regime's 'rolling back' of the state and 'rolling out' of the market may be complementary and constantly negotiated by the state and non-state actors (ibid). Leszczynski (2012) remarks that the case of OSM does not fit neatly in a 'state'/ 'market' dichotomy and it results in new hybrids, as OSM is volunteer-based but also engages with corporate actors such as its partnership with Microsoft. Wilson (2012) writes about the developments associated with the advent and proliferation of location-based service (LBS) and documents the discourses on LBS, illustrating how the growth of LBS is narrated

in ways interweaving "government regulation, capitalist growth and speculation, designs for socio-behavioral change, and re-imaginings of urban interaction" (p.1268). These two studies highlight the need to continue with interrogating the political economic transitions embodying and intersecting with VGI production, dissemination and usage. Yet these investigations tend to focus on North American and European contexts (Leszczynski 2012). This necessitates more research on how 'state/market/citizen' (ibid) have worked in shaping and in turn been impacted by the production of VGI in various contexts. As I will detail in the empirical analysis, while the Chinese government has stringent control over mapmaking and VGI, there have been policies and strategies to foster the development of 'the market' for online mapping industry. In China's nascent online mapping industry, entrepreneurs and ICT start-up actors have paid attention to the potential of VGI and OSM for LBS. These dynamics lead to a complex picture of traits of neoliberal logic attempting to facilitate LBS development, which intersects with the evolving regulatory regime on online mapping.

Another strand of research investigates the participatory potential of VGI (e.g., Tulloch 2008; Haklay 2012; Lin 2013a). In particular, a number of studies explore motivations of OSM contributions (e.g., Eckert 2010; Lin 2011; Budhathoki and Haythornthwaite 2013; Lin 2015b). Eckert (2010) calls for attention to multiple 'mobilizational frames' that go beyond the scale of individuals and include multi-user relationships. Lin (2011) suggests four social worlds of OSM mappers: business social world, government social world, NGO/third sector social world, and a social world of loosely coupled individuals. These motivations can more or less find their presence in my study, including personal empowerment, contributing to free and open data movement, and research interests. Yet the group of less active contributors stands out more prominently in my study, while existing studies tend to focus on committed contributors of OSM (e.g., Eckert 2010). Dalton (2015) investigates the role of software

developers, a new group of mappers without formal training in cartography or GIS, in Google Maps-based applications. He suggests that these developers' mapping practices are largely influenced by playful fun and profit-seeking, but he also notes the possibility of using these geotechnologies in transgressive ways (ibid). OSM mappers in my study share some characteristics with those identified by Dalton (2015) in that many of my participants are from the ICT-related industry, who might be interested in using OSM for their business activities.

Moreover, Kitchin and Dodge (2007) argue that maps, rather than being ontologically secured, are always in the making and thus ontogenetic in nature. They show map use and mapmaking as embodied practice (ibid). This points to the importance of revealing how maps are constantly being made and remade. Recent studies have paid attention to the role of emotions in constituting such practices. For example, Young and Gilmore (2013) examine how the participatory GIS approach used in their project working with the Maijuna people of the Peruvian Amazon has resulted in positive emotions in participants. Some studies discuss emotions aassociated with VGI mapping in relation to empowerment possibilities and frustrations expressed in interacting with these mapping platforms (e.g., Lin 2011; Gerlach 2010; Lin 2015b). In light of these studies, I intend to include a discussion on foregrounding the emotions constituting OSM mappers' experiences in China.

These two strands of research have provided fruitful discussions on VGI production and its impacts. However, with a few exceptions, there are few studies attempting to unravel both the political economic processes and individual mappers' experiences of VGI production and usage situated in particular geographical and social settings. I thus seek to address this gap through the first aim outlined earlier.

2.2. Legalities of VGI?

Relatedly, little is known with respect to how various actors might encounter state regulations for emergent VGI, for which I turn to the aspect of legality from the law and society literature. No doubt, there is a rich body of work on legal dimensions of technology development and usage such as in Science and Technology Studies (e.g. Jasanoff 2004). Tremendous efforts have been made in combating increasing state surveillance and corporate control of the Internet in, for example, the work on media reform (e.g., Freeman et al. 2016). Also, there are studies examining legal dimensions of GIS development (e.g., Onsrud and Rushton 1995). For the recent growth of VGI and new spatial media (Crampton 2009), studies have examined its implications for privacy (Elwood and Leszczynski 2011), data licensing issues (Crampton 2009) and rights to access and use data (Scassa 2017). Nonetheless, the current discussion largely focuses on explicating how certain regulations and data polices by state and corporate actors might evolve over time or what policies should be employed. We know little about how users might encounter or make sense of these regulations and policies. It is thus imperative to study users' experiences encountering these rules and regulations, especially considering the growth of everyday mappers, who might not have had much previous experience with state regulations regarding spatial data production and dissemination.

To address this gap, I find the notion of legal consciousness helpful in examining legalities of spatial data production and usage intersecting with technological changes and political economic transitions. Legal consciousness refers to "the ways in which people make sense of law and legal institutions, that is, the understandings which give meaning to people's experiences and actions" (Ewick and Silbey 1992, p.734). As such, legal consciousness is a

social process (Young 2014), and legal consciousness research foregrounds "everyday social practices that both enact and challenge existing laws" to reveal how the meaning of legality is mediated through "particular problems, particular organizations, and particular social institutions" (Marshall and Barclay 2003, p. 617).

Studies on legal consciousness have addressed issues related to rules and rights consciousness in China (cf. Boittin 2013). For example, Michelson (2008, p.64) acknowledges that as the government has intended to use legal reforms to resolve popular grievances, "an increasing contentious citizenry" has emerged in China. Gallagher (2006, p.785) contends that changes in legal consciousness takes place in two dimensions: "changes in one's feelings of efficacy and competency vis-à-vis the law, and changes in one's perception/evaluation of the legal system". Through a study of legal aid plaintiffs in Shanghai, Gallagher (2006) notes that individual feelings of efficacy and competency of the law undergo positive changes while there are more negative perceptions of the legal system regarding its fairness and effectiveness. Meanwhile, as Boittin (2013) points out, these studies tend to examine cases in which research participants are engaging with the law directly. My study thus enriches the existing research with a case involving participants who might not intend to engage with the law directly. In particular, Gallagher's (2006) second dimension of perception/evaluation of the legal system is more evident in my study.

3. Methods

I collected and analysed interview data and online documents to interrogate the complexities of OSM constructions in China, which allowed me to elicit rich information from the interviewees regarding their mapping experiences and analyse the broader social conditions in which these mappings are situated. This approach is in line with Hine's (2009) approach of

‘multi-sited ethnography’, in which she “identified sites to visit and people to interview by a mixture of sources, online and offline” (p.13) for her study of the interplay between the biological discipline of systematics and the Internet. To understand OSM contributors’ experiences, I identified my interviewees using the OSM website. Specifically, I focused on edits on the Beijing area as it is one of the most heavily edited places in China (Figure 1). With the Beijing area displayed, I selected the History tab on the OSM main page which provides the edit history of the displayed area including editor information. I then used the “message” function from OSM to invite these contributors for interviews starting from inviting the contributor with the most recent edit at the time. This approach allowed me to speak to mappers with varying degrees of contributions, including those occasional OSM contributors. My leading interview questions, which were also used in Lin (2015b), include the following aspects: in what ways they began knowing about OSM, why they were interested in using and contributing to OSM, processes and challenges of providing VGI, types of data they produced and wanted to produce, experiences of participating in related workshops and gatherings for mapping, factors influencing their practices, and their opinions on the role of various online mapping platforms including OSM (see also Lin 2015b).

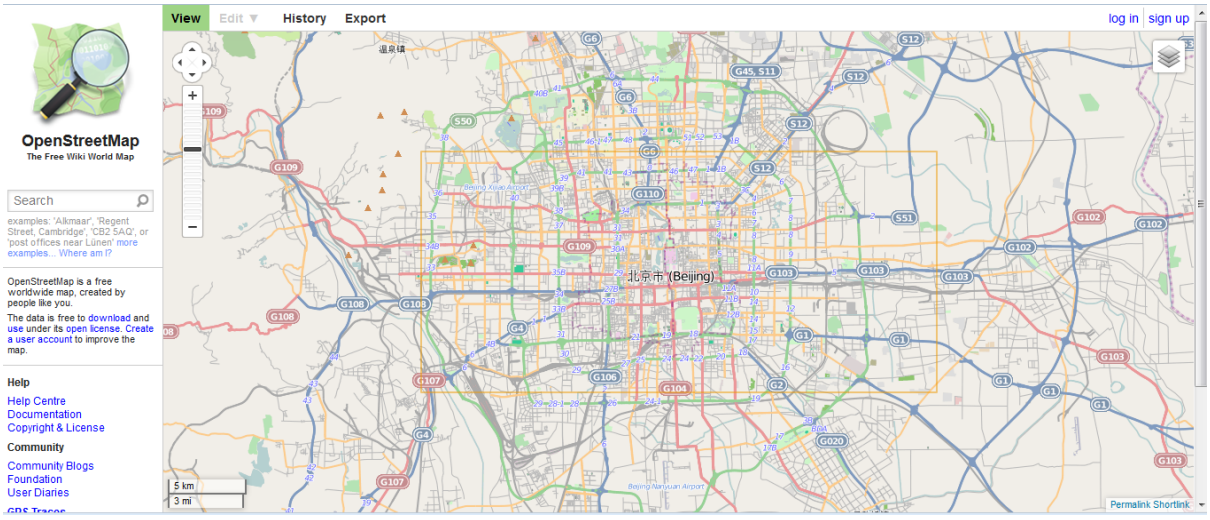

Figure 1: Screenshot of Beijing in OSM (accessed August 2013)

I supplemented the interview data with materials derived from a range of online documents, including news reports, blog posts, and other online materials on pertinent topics. I visited the WikiProject China website (an OpenStreetMap Wiki page) and the OSM Chinese mailing list. These platforms not only provide rich data with respect to the efforts of OSM practices in China, but also serve as what Hine (2009, p.13) would describe as a 'provisional "map"' of OSM development in China. I conducted keyword searches on OSM in China using search engines such as Google, Yahoo, and Baidu as well as visited relevant government websites and popular blogs on ICT news in China. Analysing materials collected from these sites provides insights into the evolving online mapping landscape in China.

I conducted thirty-one interviews, including one email interview, with OSM contributors in China from July to August 2012. Most interviews were about one hour in length. Eight interviewees were associated with the public sector including five postgraduate students, two researchers, and one employee in a state agency. The rest were from the private sector. There was only one Chinese female interviewee, which might be partly due to the sampling process as it is biased towards the more recent OSM mappers. Yet the low proportion of women mappers might not be an anomaly as the "male-dominated editorship and moderation" in OSM has been observed and discussed elsewhere (Leszczynski and Elwood 2015, p.16; Stephens 2013). The overall profile of my interview participants shares similar characteristics to those found in existing studies (e.g., Eckert 2010; Lin 2015b): the majority of them have higher education background and they are dominantly male. All the interviews were conducted in Chinese except one in English. The face-to-face interviews were recorded and transcribed in the language they were conducted. I analysed the transcripts and documents

following Silverman (2000), in which process I read the text, highlighted keywords, and coded the materials to identify key themes in an iterative way.

4. Online Mapping Developments in China

4.1. The state

Cartographic projects have long been associated with state projects, constituting state-making (Leszczynski 2012; Pickles 2004). The advent of Internet mapping has posed new challenges to the Chinese state. On the one hand, the Chinese state has a vested interest in fostering development of its nascent online mapping industry. On the other hand, such development might render more engagement with mapping from non-state actors including citizens which can be seen as disruptive by the state. In many ways, the Chinese state's approaches on online mapping follow a similar logic deployed for its ICT development.

The Chinese state has long promoted a discourse of 'catching up with the West' regarding ICT development (Lin 2008). Since 2003, there has been a shift in policy priorities to emphasize more on indigenous innovation as opposed to labour-intensive export, especially in more recent years responding to rising labour costs in China (Zhou 2015). A common strategy of developing ICT and related industries is through certain incubators with special policy support before wider policy implementation (ibid). Underpinned by a similar strategy, the 'geoinformation industry' was listed for the first time in the Eleventh Five-Year Plan (2006-2010)[1], reflecting the Chinese state's attempt to facilitate so-called 'technoscientific capitalism' that Leszczynski (2012) observes in the North American and European contexts

[1] China's Five-Year Plans are a legacy of the country's socialist period with the first plan running from 1953 to 1957. In the market reform era, these five-year plans set out national development guidelines and are seen as playing a role close to an 'election manifesto' for the Chinese Communist Party (The Economist 2015).

in her analysis of the geoweb. Technoscientific capitalism takes the form of transitioning from a manufacturing-oriented economy to one emphasizing capitalising on innovations and creativity responding to the 1970s energy crisis (Leszczynski 2012; see also Sunder Rajan 2006). Meanwhile, the rhetoric of protecting national interests and security is dominant in the Chinese government's regulations and strategies, which can be reflected in new mapping regulations that took effect in 2016. I discuss these regulatory changes on mapping further in Section 4.3, after which I engage more fully with the idea of legality concerning citizen mapping, especially considering the development of OSM in China in Section 5.3.

In these processes, some branches of state agencies in mapmaking have been turned into market-based enterprises, which can be viewed as part of developing a market-oriented economy launched by the government since the late 1970s. The state no doubt still maintains firm control of the fundamental geographic information data production, in which the State Bureau of Surveying and Mapping (SBSM) has played a dominant role. Yet a shift started in 2008 concerning the main focus and responsibilities of SBSM. Previously, the SBSM primarily worked for the government and focused on fundamental surveying and mapping. Currently, more emphasis is raised on serving the public directly such as engaging with emergency management, monitoring and managing geoinformation collection and application, organizing basic research in surveying and mapping, and stimulating scientific progress and innovation (NASG 2012). In 2011, the SBSM was renamed the National Administration of Surveying, Mapping, and Geoinformation of China, or NASG (NASG 2012), although some governmental documents might still bear the name of SBSM after this name change. As such, the SBSM has been transformed into a governing body with a more diverse set of tasks.

Meanwhile, there is ongoing marketization to support the geoinformation industry. The

National Plan for Geoinformation Industry (2014-2020) (National Development and Reform Commission and State Bureau of Surveying and Mapping 2014 (NDRC and SBSM 2014 hereafter)) states that the major user groups of the geoinformation industry have expanded from being mainly governments to include governments, enterprises, and the general public. According to this document, since the Twelfth Five-Year Plan period (2011-2015), the geoinformation industry had an annual growth rate of 30 percent, and the income of the industry reached CNY$260 billion by 2013. There were over 22,000 companies related to the geoinformation industry, employing over 400,000 workers, with eighteen geoinformation enterprises having started their initial public offering (IPO) (ibid). Arguably, the IPO processes indicate that the geoinformation industry in China has entered the mainstream (Zook 2005).

However, this document also lists a number of "severe challenges" (NDRC and SBSM 2014, p.3), namely, 1) threats from developed countries gaining more market share and consequently squeezing the space for China's geoinformation industry development, 2) high dependence on foreign satellite and remote sensing technologies for navigation service and LBS and lagging behind developed countries in geoinformation application service, and 3) small scale of the geoinformation industry, incomplete value chain, low level of innovation and competitiveness, and less established policies and regulations. Six key areas for further development are in turn designated to address these challenges: surveying and remote sensing data service, surveying and mapping equipment production, geoinformation software development, geoinformation and navigation service provision, geoinformation application service, and map publishing and mapping-related products. In this national plan, a language of international competition is employed and the important role of the state to set out strategic plans for the geoinformation industry development is stressed. For example, one strategy is to "cultivate" a number of innovative domestic enterprises with independent intellectual

property rights to "increase [the industry's] international competitiveness" (ibid, p.11) and to "actively promote" geographic information enterprises to undertake businesses overseas to "increase the rate of international market share" (ibid, p.12).

While China has undergone massive transformation from a centrally planned economy to a market-oriented one and has shown some complex traits of a neoliberal logic (e.g., Zhang and Peck 2016; Lin and Zhang 2016; but see Wu (2015) for his questions on a neoliberal logic in China), the state's steering to guide and support industry development remains prominent in official discourses. Meanwhile, the development and evolution of geospatial technologies have increasingly encompassed a wider range of practices ranging from cartographic representation to personal way finding that can be edited by lay persons, a transformation no doubt having pushed the state to expand and transform its main arm in charge of this field, NASG, as illustrated above. So far, I have shown how the state is not a monolithic entity and also unpacked how the state exerts its control in these processes, which are not without contestations from non-state actors, as will be illustrated later in the paper. I move next to depicting the online mapping market.

4.2. The market

Several online mapping services emerged in China in the late 1990s and early 2000s, including Go2Map, Mapbar, and MapABC, which in large measure parallels online mapping developments in the West. These services later were acquired by, or built partnerships with, larger Internet firms. For example, Go2Map, launched in 1999 and claimed to be the first online mapping service website for the Chinese public, was acquired by Sohu (a web portal company in China) and renamed Sogou Maps. A number of mobile mapping service providers were acknowledged by my interviewees, including Nokia Maps, Apple Maps, and

TigerMap. A few of my interviewees also indicated their interest in developing LBS such as providing certain mapping products for customers, as also noted in Section 5. Clearly, this is a growing and rapidly changing market in China.

The state takes notice of this, pointing out the need to begin collecting statistics on the geoinformation industry development (NDRC and SBSM 2014). Drawing upon related documents, I outline major establishments of the online mapping market, highlighting the major actors participating in this market and revealing the main logic of these developments, which helps to situate OSM mappers' experiences and OSM constructions more broadly.

Two main segments in the online maping industry are identified: surveying and mapping entities and mapping service providers (iResearch 2013). The surveying and mapping entities are those engaging with digital information collection, including collecting fundamental geographic information, satellite and remote sensing imageries, and digital navigation mapping data (NASG 2012). There are stringent licensing policies in this segment, and those who have the licences usually have a history working with the government and a strong technological backgroud (ibid). At the time of writing, twelve organisations have obtained licences in this segment. At the same time, the accelerated development of digital cities spearheaded by the state provides a great deal of business opportunities for these surveying and mapping entities. In this setting, organisations in this segment have large market share with some gaining a status similar to that of monopolies (ibid). For example, NASG controls fundamental geographic information production, and NavInfo and AutoNavi are the main providers for navigation data. Nonetheless, it is envisioned that this segment will become more open to other competitors in the long run. More companies will receive licenses and richer data will be available, because the increasingly powerful global satellite and remote

sensing technologies can weaken the monopolistic control of resources (ibid). It is notable that in a state document, technological advancement is viewed as a possible force to 'liberate' the segment. This view is echoed in my interviews discussed in Section 5.3, which indicates a certain degree of perceving these policies negatively, manefesting Gallagher's (2006) second dimension of legal consciousness in China.

The mapping service providers segment is much more differentiated, which may include GIS platform developments and applications gearing towards satellite navigation, LBS, and other so-called professional applications. For example, some professional appllications are developed for "digital city, smart transportation, land resources management and logistic management" (NASG 2012, p.261). There are high expectations for the future of LBS developments in China, and LBS has a higher level of market competetion than that of the surveying and mapping entities (NASG 2012).

A further delineation of China's online mapping market includes three main types of services: Internet mapping services, vehicle navigation mapping services, and mobile mapping services. In 2012, the market value of online mapping services in China reached CNY$ 2 billion (iResearch 2013), the largest component being vehicle navigation mapping services with a market value reaching CNY$ 1.2 billion. Two companies dominated the vehicle navigation mapping services: AutoNavi had 51.6 percent of the market and NavInfo 38.4 percent. The Internet mapping services came second, with a market value of CNY$ 630 million. The mobile mapping services, however, had the highest growth rate, influenced by the recent trends of more mobile Internet users in China (CNNIC 2014).

The CNNIC (2014) reports that by June 2014, the penetration rate of mobile map usage was

46.9 percent, increasing by 11.5 percentage points from 2013. Major mobile map product competitors include AutoNavi, Baidu Maps, Sogou Maps, Soso Maps (later acquired by Tencent and named Tencent Maps), Google Maps and Apple Maps (iResearch 2013). Owing to the constraint set up by obtaining government licences, mapping data sources are mainly from AutoNavi and NavInfo. Baidu, Tencent and Sogou are three domestic Internet giants seeking to occupy the incipient online mapping market in China. Feeding on the fundamental geographic information provided by AutoNavi or NavInfo, these companies utilise their Internet development experiences and search engines advantages to provide their own mapping products (iResearch 2013). Baidu Maps has the highest usage rate from mobile phone users (63.7%), followed by NavInfo (32.4%) (Table 1, CNNIC 2014). While according to iResearch (2013) there is no mature profit generation model from these services, these major corporate actors will continue to pay close attention to the prospect of developing mobile Internet platforms, given the increasing number of mobile phone users.

Mapping Service Provider	Usage Rate	Parent Company
Baidu Maps	63.7	Baidu
AutoNavi	32.4	AutoNavi
Sogou Maps	14.5	Sohu
Google Maps	13.9	Google
Tencent Maps	11.9	Tencent
No separate brands but attached to mobile phones	9.1	Not known
TigerMap	4.3	TigerMap
HeMap (previously China Mobile Phone Navigation)	2.2	China Mobile Group

Table 1: Major Mobile Phone Mapping Service Providers in 2014 (source: CNNIC 2014)

In summary, the past decade or so has witnessed the emergence and transformations of various enterprises and entities providing online mapping services in China. This is partly responding to growing demands from an enlarging middle class and rapidly increasing Internet users. The ongoing urbanization and the proliferation of mobile device usage, along with a growing middle class in China, have also played a role in constituting a demand for

vehicle navigation and daily journey planning using online mapping. The fundamental geographic data provision is dominated by state entities and a few enterprises specialising in surveying and mapping, which, for some observers, is bound to change in the future considering technological advancement. A higher level of competition that involves a greater number of enterprises is seen in the segment of online mapping services and customised applications. As such, these developments are indicative of an economy that possesses both a heavy hand from the state in various areas but in a more sophisticated manner with complex traits of neoliberalization (e.g., Lin and Zhang 2016). In these processes, regulations devised and deployed by the state are no small player, discussed below.

4.3. The regulation

On 1 January 2016, China's new Map Management Regulations took effect, a strong manifestation of the government's efforts to control the Internet mapping landscape in China and to also leave room for commercialization and technological innovation. A news analysis published in People's Daily, a mouthpiece for the Chinese government, conveys the importance of implementing the new regulations to its readers. The previous regulations, entitled Map Publishing Management Regulations, were issued in 1995, which understandably did not address issues related to the Internet. The previous mapping regulations focus on the creation and publication of general reference maps and thematic maps, with two main levels of organizations emphasized: the national and the provincial. This news analysis notes that in the past two decades, the ways maps are produced and distributed as well as their contents have changed considerably. During this period, many state agencies have been transformed into private enterprises, resonating with the process noted in NASG (2012). This analysis states that mapping regulations thus need to expand and

adjust their coverage areas and to help improve the government's public service and boost science and technology innovation and industry development on geospatial information.

Compared to the previous regulations, the new regulations have three additional chapters on map assessing, Internet mapping services and monitoring, respectively. In particular, maps to be released to the public should undergo the map assessing process by certain departments. The main purpose of map assessment is to make sure that there is no inaccurate or missing information, and to protect state sovereignty, security and interests from the possible exposure of state secret information. For Internet mapping services, their servers should be located inside China. No one can upload records that are prohibited by the government to be shown on maps. The new regulations have added a third administrative level of governance: the county level.

At least two observations can be made regarding the new regulations. First, one might argue that these stringent regulations on licensing for Internet mapping services are part of the state's long-standing efforts to maintain its strong political control, while they also have economic consequences that tend to favour domestic firms (Chen et al. 2013). Second, a stronger emphasis on lower levels of administration in this field may on the one hand attempt to accompany the state's digital city initiatives and on the other hand to respond to the decentralisation tendency of online mapping. Internet mapping production and dissemination is not placeless and needs to be controlled and managed at a finer scale in the state's eyes. This can be seen as sharing a similar logic to the 'geo-coding' governmentality for more efficient management of the heterogeneous environments (e.g., Rose-Redwood 2012; Lin 2013c). Meanwhile, the new regulations explicitly require that government agencies at all levels as well as the news media intensify the education of national territory and strengthen

citizens' territorial awareness, emblematic of what has been insightfully analysed by scholars regarding the role of forming a geo-body through cartographic representation (Winichakul 1994). Importantly, it is also necessary to examine how these state efforts, the growth of online mapping market and the tightened regulatory power have been met by various citizens, which is the focus in Section 5 through the case of OSM.

5. Constructing OSM in China

5.1. OSM's entry to China and mappers' motivations

The emergence and development of OSM have drawn notable attention from both the research community and geospatial technology industries worldwide, including those from China. Many respondents noted that they learned about OSM from ICT news posted on technology forums and microblogging sites. For example, a post entitled "Sharing Free Map: OpenStreetMap" introducing OSM was published in the Open Source China forum in June 2009, perhaps one of the earliest publicized discussions about OSM in China. While brief, this post highlights a few key points regarding the prospects of OSM, which to a large extent accord with views from some of my interviewees including those who were interested in LBS, noting their interest in using OSM for navigation applications and related products.

Another visible wave of introducing OSM in China occurred in 2012, with a number of news reports and blog posts on OSM, which led to the growth of occasional contributors. This surge of interest can be partly attributed to the news of Apple terminating its use of Google Maps at the time, as a number of my interviewees noted that they started to explore OSM when they heard about this news. OSM developments have also been discussed in state-sponsored venues. For example, in 2012 there was a translated report in the NASG sponsored China's Survey and Mapping magazine. This report provides a lengthy discussion on the

development of OSM, including the recent adoption of OSM data by Apple. Meanwhile, there has been active academic research in China using OSM data. At the time of writing, a keyword search on CNKI.net (an online archive collection of Chinese academic journals and theses) using the term "OpenStreetMap" returns 408 records of papers and theses published from 2007 to 2016.

The number of active OSM contributors overall is small in China, with an even smaller group of dedicated contributors compared to many Western countries. The contributors tend to be those who are well educated and tech-savvy. A large proportion of my interviewees have had experiences in the IT or GIS industry. Indeed, many VGI contributors come from software developers, such as those illustrated in Dalton (2015). The Chinese OSM mailing list, set up in 2010, does not seem to have a constant stream of discussion, which is emblematic of the overall small size of active OSM contributors in China. However, there have been some extensive discussions occasionally, including one on road classification and another one on tagging road names. Other themes and issues emerged on this mailing list include questions and answers, announcements, and newcomers' self-introduction. Overall, while there is growing interest from academia in China on OSM, OSM has been exposed to its Chinese users mainly through the dissemination of technology and science news. Non-state actors have played an important role in introducing and promoting OSM in China. These actors constitute various social groups and individuals, including those from the geospatial industry and IT industry.

Four types of motivations can be identified in this research. First, personal interest in mapmaking is an important drive to contribute to OSM. For example, when asked why he

would be interested in contributing to OSM, Interviewee 1, an active contributor and a software programmer, replied,

> Mostly because I enjoy making maps myself. You won't have many direct benefits at all, like fame, from contributing to OSM in China. […] It's not that difficult [in terms of long-term commitments]. If you truly enjoy doing it, it is quite fun. (July 2012)

Clearly, this participant had a strong personal interest in mapmaking and considered making OSM contributions to be 'fun' rather than as expecting benefits from external sources in return. Yet it is also more than just for 'fun'. Interviewee 1 aligned his OSM mapping to his childhood dream of making maps. This reference to fulfilling his childhood dream indicates that OSM serves as a way of individual empowerment. Such a form of enthusiasm for mapmaking is shared by many other OSM contributors, often associated with amateur cartographers (e.g., Lin 2011). A second motivation derives from a desire to enhance the data quality and address data omissions in OSM, which can help the local community at the same time (e.g., correcting errors; contributing new data). Interviewee 2 noted,

> My first reaction was to look at my neighborhood, and I saw that many things were not there. So I spent a whole afternoon adding those to the map. […] Many small things that only local people would know about. […] I just could not help it. (August 2012)

This motivation is perhaps one of the most frequently cited motivations for OSM mappers (e.g., Eckert 2010), which tends to be addressed as a similar motivation to the first one raised earlier. While the difference between these two motivations might be very small, it is useful to highlight this particular drive of enhancing data quality through user contributions, as these mappers tend to view OSM more as large databases rather than cartographic representations associated with the first motivation. My interviewees addressing this motivation tended to be

less frequent OSM contributors, and they often cited the example of data and knowledge production via Wikipedia, simultaneously illuminating their practices driven by personal exploration. As such, they did not explicitly make reference to a larger community for OSM mapping (e.g., Lin 2011), and yet they were contributing to the larger 'digital grid map' (Caquard 2011).

A third motivation has to do with work-related interests and needs. Interviewee 3 working in the geospatial technology industry noted that he found OSM a good fit for making an editable map for his customers. Interviewee 4 observed that main users of OSM were young people and urban residents, who saw great potential for commercial development regarding user-generated geographic information. Interviewees who were students and researchers acknowledged that they were interested in using OSM for their research projects. Lastly, a few interviewees noted that they explored OSM simply because they were curious about this form of mapping or due to accidental discovery. For example, Interviewee 5 changed his cell phone and the map service also changed, for which he noticed OSM.

An OSM contributor may have more than one motivation. For example, interviewees exploring the use of OSM for their work might also embrace the idea of open data and view OSM as commons (e.g., Quinn and Yapa 2016). Some of the less active contributors can be seen as engaging in a project-based way of mapping, such as using OSM data for research projects and engaging with a project initiated by a magazine inviting artists for mapping out certain parts of Beijing in OSM. Meanwhile, relatively longtime OSM contributors in my study share similar motivations of longtime OSM contributors elsewhere such as their interest in amateur mapping and data contribution via crowdsourcing.

5.2. Negotiations of spatial knowledge production through OSM

While the emancipatory potential of OSM has been widely noted, studies have addressed nuanced digital divides and negotiations of spatial knowledge production through OSM and VGI more broadly. This section details further in the context of China how these negotiations take form and their possible implications; it also pays attention to the affective dimension of OSM contribution.

In OSM, one or more tags are used to provide attribute information for each object. A tag is provided in the form of a key and a value (e.g., "waterway=river"). Users may propose their own tags. However, sets of commonly used tags are those approved by OSM users to be visualized on the base map. The flexibility of constructing spatial data such as the tagging approach, while playing a key role in enabling OSM data gathering and mapping from non-experts worldwide, has led to ongoing tensions and negotiations of spatial knowledge production with respect to database ontologies, visual representations and knowledge politics (e.g., Eckert 2010; Stephens 2013; Perkins 2014).

One issue of using OSM is about data categorization, as my interviewees noted the difficulty of using the right labels or categorization at times. The data categorization issue in OSM has been addressed in a few other contexts as well (Eckert 2010; Stephens 2013; Glasze and Perkins 2015). Identifying the appropriate tag is not always straightforward for OSM beginners (Lin 2015b). Issues of categorization have caused confusion and heated debates even for experienced contributors in this study. A number of participants discussed their struggles with the road classification system embedded in OSM. For example, should a road be identified as a primary or secondary road? Road editing is an important issue for OSM, as viewed by many of my interviewees, which constitutes a major part of OSM data. It is also of

interest to application development gearing towards navigation and LBS. As noted by my interviewees, the current road categorization system encoded in OSM is rooted in the British system and is different from that of China. The challenge of categorizing Chinese roads by non-experts is also partly due to the lack of official categorisation guidelines for the ordinary users, while my interviewees also acknowledged that it required professional knowledge regarding road categorization in China. Therefore, for many non-experts, mapping a key feature in OSM, the road, remains a significant challenge.

The talk page of WikiProject China provides another venue detailing the discussions on Chinese road classification in OSM. There were questions about how to address different dimensions of road classification and variations in different cities and how to make the classification more accessible to average users. At the time of writing, this issue of road classification seems to have been resolved, with a compromised and simpler classification approach proposed. For example, for roads with an official sign of highway, they would be tagged as a 'motorway' using 'highway=motorway', regardless of their administrative level status (e.g., national highway, provincial highway, etc.). Another notable debate, or a tag war, is on the appropriate way of 'naming' a street. In this debate, one contributor labelled the road name in English. A few longtime OSM contributors disagreed, citing the OSM convention that road names in this case should be labelled using their Chinese names under the "name" tag, while using the tag of "name:en" for their English names. This contributor responded that there were examples elsewhere (e.g., Beijing and Hong Kong) in which English names were used under the "name" tag and that the tagging could be determined by the local OSM community (hence a possible difference from the above cited 'OSM convention'). According to the final exchange shown on the mailing list, this particular contributor appeared to have conceded. These examples show that mapping is both mobile

and immobile (Perkins 2014), with embedded codes in OSM for spatial data categorization as well as possibilities of "new writing, new lines of inscription and new lines of demarcation" (ibid, p.18).

However, reconfiguring existing ways of mapping in OSM such as efforts noted above may not be feasible for every OSM contributor. There are also issues of entirely different types of spatial features not available in OSM. For example, residential areas in China, shaped by the 'work unit' system derived from the planned economy, differ greatly from the 'neighborhood' notion in the UK and US (Interviewee 6). Relatedly, there are cases that the corresponding categories might exist, such as super markets and coffee shops, but they may appear to be ambiguous to some OSM users. For example, one interviewee pondered if a particular café should be tagged as a restaurant or coffee shop (Interviewee 7). They might eventually find the answers that they believed are more convincing, but this usually requires time and also more careful reading of the instructions (Interviewees 7 and 8).

These struggles and negotiations are important issues, as being able to see the features identified appropriately on the map could be highly motivating for many less active contributors. Moreover, these struggles are emblematic of knowledge politics (Stephens 2013; Elwood and Leszczynski 2013). First, it is notable that knowledge produced through OSM in China might be gendered. While it is beyond the scope of this paper to elucidate further on this, the very low proportion of Chinese female interviewee indicates this gendered dimension of knowledge production in and through OSM. Such gendered knowledge might reinforce existing gendered experiences and norms. For example, my female interviewee, Interviewee 9, commented that, half-jokingly, women tended to show less interest in finding directions, which was usually considered as their male friends' job. As such, it is likely that

OSM in China represents disproportionally male spaces influenced by conventional gender roles (see also Leszczynski and Elwood 2015; Stephens 2013). Second, OSM often requires some reworking to map local features, and the reworking and reconfiguration may require substantial efforts, which can be beyond the reach of OSM contributors without sufficient time or resources. In this study, imprints of China's past and current urbanization processes further 'complicate' the process of OSM mapping, which might baffle many lay persons interested in contributing to OSM. Therefore, despite the lower barriers to mapping enabled by Web 2.0 technologies and mobile devices, we need to pay continuous attention not only to nuanced manifestations of digital divide, but also to revealing the conflicts and negotiations between the embedded spatial knowledge frameworks in the mapping system (e.g., OSM's road classification system) and different societal settings (e.g., Bittner 2017).

And, third, these processes detailed above show that there is a loose, although small, community of OSM mappers in China. The dynamics of interacting with OSM can be illustrated through the three dimensions of interactivity suggested in Lin (2015b), showing varied levels of knowledge of using OSM. For example, the tag war of road names can be seen as the 'user-to-user' dimension of interactivity (ibid). Interviewee 10 noted that there were not enough Chinese translations regarding the use of OSM, which reflects the 'user-to-documents' dimension of interactivity (such as engaging with help documents) intertwined with the 'user-to-system' dimension of interactivity (such as issues of language barriers) (ibid). Interviewee 11 reflected that the main difficulty might not be due to knowledge of manipulating the software itself but one's knowledge of geographic information, a good example of the 'user-to-system' dimension of interactivity (ibid). Five interviewees claimed that OSM was not user friendly enough, which can be partly attributed to the struggle of labelling certain features. In particular, Interviewee 10 remarked that the use of some tools

required professional knowledge in mapping data collection. As such, he considered that OSM was not yet suited for widespread adoption by ordinary people in China. On the other hand, eight interviewees stated that OSM generally was easy to use, although some of them suggested that it could still be challenging to master all the tools available. While many interviewees might find it challenging to find the right documentation for labelling as well as the appropriate label to be used for their data, two interviewees noted that OSM labelling was sufficient. For example, Interviewee 12 commented that OSM had sophisticated labelling, such as the availability of the slowdown sign.

Moreover, as noted earlier, some studies have discussed emotions concerning VGI and participatory mapping. Nonetheless the emotion of worrying and pressure felt from OSM mappers and participants has been less discussed. Two interviewees acknowledged the pressure of contributing OSM data, worrying about the quality of their data. The pressure would have been much less if one was only mapping for his or her own usage (Interviewee 10). Even for a professional like Interviewee 13, he noted that he had 'a bit of fear' regarding OSM contributions, with lingering questions at times such as whether he got it right or the edits could be displayed properly. Such pressure can be a barrier for sparking more active contributions. Similar sentiment is found in some OSM contributors in the UK (Lin 2015b).

5.3. To map, or not to map by the citizen? An exploration into legal consciousness

There are negotiations with, and contestations against, state policies regarding spatial knowledge production, although they might not take the form of explicit counter mapping or participatory mapping. On the WikiProject China page, it is noted that OSM mapping is illegal in China. The page lists links to four news reports about China's stringent control over mapping and its crackdown on foreigners' illegal mapping practices that took place in 2007,

2008, 2009 and 2010. Meanwhile, it is suggested that the government might not be willing to, or have the resources to, persecute every citizen mapper. From this page, there are also comments noting how OSM might constitute a way of resistance to the Chinese state. These discussions involving users from outside China point to the issue of legality (e.g., Marshall and Barclay 2003).

Almost a third of my interviewees addressed that OSM contributions were in conflict with the mapping regulations in China. Meanwhile, it is possible that some participants did not recognize that OSM mapping could be seen as a sensitive issue in the eyes of the state regarding national security (Interviewee 4). This 'not everyone knowing the game' (to borrow Young's (2014) term of 'everyone knows the game') is reflected in a few more recent posts asking if OSM is legal or not on Zhihu, a Chinese online Q & A forum. These encounters from my respondents constitute various moments of negotiating with state policies and regulations concerning citizen mapping. Interviewee 1 suggested that this way of mapping was a gray area. Interviewee 4 commented that usually participants might not need to worry too much, because most people would not map the sensitive areas. Here, both Interviewees 1 and 4 were aware of the state mapping regulations. For Interviewee 4, his perception is that the state is mainly concerned about 'sensitive areas' being mapped by citizens. This perception, I argue, underpins a skeptical view of the legitimacy of the state's strict regulations, as it reflects a belief that everyday mapping should be allowed as long as it does not involve mapping 'sensitive areas'. Other general feelings were that most of these OSM contributors were aware of the information censorship in China, and that these contributors contemplated that it would be fine to engage with OSM if the website has not been officially blocked by the government. Together, these engagements might appear being opportunistic and fleeting, as Ewick and Silbey (1992) might have agreed. Yet as Ewick and

Silbey (1992) also note, they constitute a form of tactical engagements, in this case, with state regulations in the face of powerful state institutions and strong political control in China (see also Lin 2013b).

Four interviewees directly questioned the effectiveness of such policies or expressed their opposition against these policies. For example, Interviewee 14 questioned the effectiveness of 'protecting national security' through distorted geographic coordinate information, pointing out that more advanced technologies elsewhere could be used to obtain such information in its corrected form, echoing a view illustrated earlier in Section 4 regarding how technology advancement might impact state policies. Still others pointed out the conundrums posed by these state policies, as they would not be able to promote OSM more widely. Consequently, not many people knew about OSM in China (e.g., Interviewee 15). In addition, a few interviewees suggested that there were a number of free commercial online maps that could satisfy everyday demands such as navigation and finding points of interest. As such, the public might not feel the need to use and contribute to OSM.

These above experiences and encounters show nuanced differences with respect to the legality of OSM mapping in China. For those who recognize the presence of mapping regulations, they tend to hold a negative attitude towards the evaluation of the state regulation on online mapping, constituting the second dimension of legal consciousness in China noted in Gallagher (2006). Furthermore, their OSM contributions constitute a form of resistance to the regulation. Their personal stance against the regulation might not be expressed publicly, which reflects Scott's (1990) notion of hidden transcripts. In other venues of online postings such as Hudong Baike (a project in Chinese on user-generated encyclopaedia entries), many netizens have mocked the distorted geographic coordinate system imposed on mapping

services, referring to it as a Mars coordinate system adopted by the Chinese state. This sentiment is embedded in the Chinese Internet culture, in which there have been ongoing efforts to resist against online information censorship (Yang 2009).

For those who have not explicitly acknowledged the state's mapping regulations, this in another way shows the weaknesses of these regulations regarding their effectiveness, especially in a heterogeneous online environment. Moreover, there might be practices of 'ignoring' these regulations, which are not entirely new, as they also exist in other realms of policy implementation in China, often manifested in the form of local-central state tension and negotiation (e.g., O'Brien and Li 1999). There were no specific discussions with respect to different levels of state authorities from my interviewees. Rather, they tended to be referring to institutions devising and enacting mapping regulations as a whole. In this sense, these discussions reflect more broadly the tension and negotiation between the state and non-state actors, especially those from a growing middle class in China.

6. Conclusions

In his book *A History of Spaces,* Pickles (2004, p.17) suggests that "cartographic reason and the project of mapping have been contested and multiple from the beginning". He also highlights that "if the new cartographies are already with us, we must also recognize that they do not have a unitary and fixed identity" (ibid, p.194). It is thus imperative to continue with telling map stories that occur in various settings. In this paper, I have provided an account of VGI constructions through the case of OSM in China with two aims outlined earlier to address existing research gaps. This is a first attempt to depict a more comprehensive picture of a map story on VGI situated in China that provides a detailed analysis of both political-

economic conditions and user experiences. Second, I have shown how incorporating legalities of VGI constructions can provide a more expanded conceptual framework to illustrate the dynamics and power struggles regarding user-generated mappings.

Specifically, I first analyzed the evolving online mapping market and state policies in China. Foregrounding the political economic processes shed light on understanding the complexities of various institutional arrangements not only to manage and control the growing interest in geospatial technologies but also to foster economic development and support entrepreneurial practices through these technologies. I then discussed OSM contributors' experiences, highlighting their motivations and negotiations of spatial knowledge production through OSM constructions. It is important to note that, while there are various motivations including personal empowerment, a significant amount of commercial interests have been involved in exploring OSM, reflecting wider efforts to exploit the locational information shared, knowingly or unknowingly, by a growing number of people. The rapid urbanization in China plays a role as well, regarding users' interests in engaging with locational information for navigation and way finding. The negotiations of spatial knowledge production took place at the intersection of data categorization, cartographic representation, and software interfaces which embody certain cultural imprints. These negotiations have implications for knowledge politics (e.g., Elwood and Leszczynski 2013; Burns and Meek 2015), as OSM constructions in China are likely to be gendered, more or less exclusive to those with high-tech backgrounds, and highly interactive. They also took place at the confrontation against state regulations, manifesting a form of legal consciousness.

This study thus provides insights into understanding how knowledge about mapping technologies and practices might travel, be mobilized, adapted, and recreated in various

contexts. These VGI mapping practices are shaped by both technological and social conditions, including China's ICT infrastructure development and its policies on spatial data production. Meanwhile, there are negotiations concerning state policies and technoscientific discourses, distributed via online forums and social networking sites, a major venue used by an emerging group that has actively engaged with Web 2.0 technologies (e.g., Dalton 2015). The technoscientific discourses also underpin to some extent the state's modernization discourses, such as reflected in the language deployed in the spatial data policies. As it is not uncommon elsewhere (e.g. Wilson 2012; Dalton 2015), the potential of VGI data has been recognized by the state and the private sector actors in China. Meanwhile, there are attempts to transform parts of government mapping services to foster an online mapping market, reflecting traces of a neoliberal logic (e.g., Leszczynski 2012), which yet is further complicated by the heavy political control on the realm of citizen mapping. There are various levels of competition in different segments of this dynamic and growing market, partly in response to the increasing level of urbanization and demands from a growing middle class to navigate the urban environment.

OSM contributors are of a small community in China, with a large proportion of occasional contributors. Many of these occasional participants usually have professional backgrounds in software development or LBS. There is yet another narrative that is inspired by the potential personal and community empowerment through the discourses of open data and user contributions shared by many OSM communities in the West (e.g., Eckert 2010; Lin 2015b). Furthermore, an overlap exists between OSM mappers' business interests and emancipatory-oriented interests regarding their concerns of the state's mapping regulations, while it is possible that some respondents are not aware of these regulations. This dynamic manifests "the multiple and contingent character of legal consciousness" (Ewick and Silbey 1992,

p.746), which constitutes a form of resistance to the powerful state concerning mapmaking and spatial data production.

This paper is intended to be a step toward a direction for more accounts of tracing the map and deconstructing the map in the wake of the ever growing usage of Web 2.0 technologies and location-aware devices (Lin 2015a; Elwood 2015; Wilson 2015; Perkins 2014). In particular, I call for more investigations of VGI constructions with attention to the interplay of broader socio-political processes and personal and affective aspects of everyday mapping including the two perspectives highlighted here: political-economic conditions and legalities in relation to everyday mapping experiences. Moreover, in addition to enriching discussions on VGI constructions, future research exploring complexities of VGI integrating these two perspectives might also contribute to better understandings of broader socio-political transformations, especially regarding how our social, cultural and economic practices have been increasingly mediated by digital geospatial technologies and data.

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